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ABSTRACT

This report examines a project design for land degradation problems in the northern and upper regions of Ghana. The project was jointly sponsored by the Ghana Council for Scientific and Industrial Research and the Agency for International Development. The council is responsible for coordinating the activities of 10 independent research institutes. Furthermore, the council advises the government on the use and conservation of Ghana's natural resources and how to employ scientific research in these matters. Using a multidisciplinary, multi-institutional design, the council brought the scientific community together to study poor land use practices in the savannah regions. The Ghana project design combined organized problem-solving methodology and a multidisciplinary team approach to produce a unique resource research program. (MR)

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THE NORTHEAST GHANA SAVANNAH PROJECT - A CASE STUDY IN PROJECT DESIGN*

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THE NORTHEAST GHANA SAVANNAH PROJECT - A CASE STUDY IN PROJECT DESIGN

by

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and

Jack D. Johnson

INTRODUCTION

In October 1974 the Ghana Council for Scientific and Industrial Research (CSIR) and the Agency for International Development (AID) jointly sponsored a multidisciplinary project design effort focused on the land degradation problems of the Northern and Upper regions of Ghana. The research-oriented project was completely designed and budgeted during a three-week period by a team of U.S. and Ghanaian experts. By virtue of the multidisciplinary team approach used, the methodology for problem analysis and program formulation that was employed, and the integrated, multiple resource research program that emerged, the effort is worth examining as a case study in project design.

H. K. Quartey-Papafio, Deputy Director of Agriculture, was leader of the Ghana team while Jack D. Johnson led the U.S. team. Other U.S. members were Donald W. Barton, Director, New York Agricultural Experiment Station; Gus Daniels, Assistant Ghana Desk Officer, AID/Washington; Bill L. Long, Office of Science and Technology, AID/Washington; W. Gerald Matlock; and Charles E. Poulton, Earth Satellite Corporation.

Three workshops sponsored by CSIR, AID, and the U.S. National Academy of Science (in 1971, 1973, and 1974) provided a background for

the recently completed effort. The first workshop recommended a National Advisory Committee on Science Policy to assess priorities in the development of science and make policy recommendations to CSIR. The second workshop recommended the establishment of a Science and Technology Planning and Analysis group within CSIR. Priority areas for special studies were identified in agriculture, industry, education and other areas. The third, held in Washington, D.C., recommended that a project design team be assembled for two to three weeks in Ghana. All of the workshops noted weaknesses in Ghanaian science, i.e., scientific institutes working autonomously, lack of coordination, and work not related to priority national needs.

The Council for Scientific and Industrial Research is an umbrella organization which is charged with coordinating the efforts of ten research institutes. Each receives its budget directly from the Minister of Finance, and the Executive Chairman of CSIR thus has the difficult task of promoting cooperation between and among the relatively independent institutes. One of the functions of CSIR is to advise the government and agencies of government on scientific and technological matters affecting the utilization and conservation of the natural resources of Ghana, and how scientific research may be most effectively employed.

The need for coordination of research for the most beneficial development of natural resources brought into focus at the 1971 workshop resulted in the establishment of the Natural Resources Committee in CSIR to undertake and coordinate multidisciplinary studies and review of

Ghana's natural resources. The Natural Resources Committee decided to initiate a study of possible threats from drought to development of the natural resources in the savannah regions of Ghana. This study would address an important problem (desertification) perceived by government and provide an opportunity to bring the scientific community together through a multidisciplinary, multi-institutional effort.

AID responded to requests from the Natural Resources Committee for financial and technical assistance by first sending Jack Johnson to Ghana in 1974 to conduct preliminary investigations into drought in the savannah. Dr. Johnson's analysis justified further study of the ecological and cultural conditions in the north. AID also made a grant of 2,000 cedis (one cedi is equal to about U.S. $.87) for the preparation of an annotated bibliography on the savannah lands. The Government of Ghana approved a sum of almost 40,000 cedis to support the preliminary planning efforts of the Natural Resources Committee. The stage was set for the project design.

PROCEDURE FOLLOWED IN PROJECT DESIGN

The project design effort began with a presentation of the background information described above by Ghanaian and U.S. officials at the opening meeting of the joint team. Instructions were given to guide the participants in their deliberations.

Organization and Assignment of Tasks

The team then proceeded in plenary session to decide upon the best way to organize its work to achieve the objectives of the task set

before it. A short discussion was held to exchange information and views with respect to the character, magnitude, and causes of land degradation problems in Northern Ghana which are considered to be "drought-related" or associated with "desertification."

Following this, the team created an executive committee from its own members, and organized itself into three working groups on: (1) socio-economic and infra-structure considerations; (2) soils, crops, forestry, agro-climatological, and water resources studies; and (3) forage crops, livestock, and fish development.

These topical areas conformed to, and built upon, the pre-meeting work carried out by Ghanaian experts under the same headings. Each working group was instructed to answer these questions:

1. In what way are the desertification processes or the periodic dry conditions affecting the human and natural resources of the region from your group's point of view?
2. What short and long-term multidisciplinary research studies should be aired at affecting the factors you identify in (1) above?
3. What are the critical indications of natural resources degradation which should be monitored?
4. What is the effect of the continuing Sahelian drought or its future occurrences on the northeast Ghana region?
5. What are the long range projections of land-use as related to human and natural resources?

6. With regard to the above considerations, what geographical limits would you suggest for your investigation?

Results from Working Groups

Working group responses to the above questions were summarized as:

1. Desertification is not so much a climatological problem as it is a land misuse problem. Social, economic, and natural resources are all being degraded at an increasing rate.
2. Possible research studies identified included:
    a. Socio-economic inventory
    b. Review of government policy
    c. Systems analysis of natural resources
    d. Resource inventory
    e. Surface and groundwater assessment
    f. Measurement, prediction, and control of soil erosion
    g. Burning (bushfires) as an ecological factor
    h. Experimental windbreaks
    i. Physiological ecology of trees
    j. Water balance
    k. Depletion of soil fertility
    l. Meteorological aspects
    m. Climatic maps
    n. Grassland improvement and management
    o. Drought tolerant forage and cultivated crops
    p. Social organizations for grazing management

Note that this preliminary attempt at project identification provided the traditional, discipline-oriented listing which commonly has resulted from similar attempts.

3. Nearly every environmental factor identifiable was listed, including solar influx. The list was clearly not one of "critical identifiers."

4, 5, and 6. These questions were generally unanswered by the working groups because of time limitations. At this early stage of the project design the deadline for input was judged to be more important than completion of the full assignment, a wise decision in view of the need for more critical problem definition demonstrated by the diversity of the input received.

Executive Committee Actions

The executive committee provided the following response to question 4 because this had been specifically requested by the Natural Resources Committee:

> At the present time the initiation of research aimed at evaluating the effects of drought in the neighboring Sahelian countries on Ghana does not seem advisable. The vastness of the undertaking would place a serious strain on the manpower and fiscal resources available in Ghana and further limit effective and productive use of whatever resources can be applied to critical Ghanaian problems. This is not to say that there is no value whatever in

making some measurements. There is a need to understand the physical system and therefore measurements are essential. However, the design of the research to be undertaken in this project will focus on Ghana and not on the extremely difficult task of evaluating the effects of a drought in other countries on Ghana.

The executive committee then reviewed and restructured the submitted "shopping list" of research studies into a coherent, integrated package which emphasized and stimulated a multidisciplinary, inter-institutional approach to problem solving. The resulting "package" had five basic sub-projects: (1) effects of burning; (2) cultivation practices; (3) water availability and distribution (4) overgrazing and deforestation; and (5) social-political-economic factors.

Problem Analysis and Project Design

The next step took place at a second plenary session in which a systems analysis approach to problem solving was presented for use by the planning groups. The analysis of the problem of the northeast Ghana region and the design of a comprehensive, multidisciplinary research project was structured and carried out with the assistance of the process flow charts (logical organization diagrams) given in Figures 1 and 2. The overall goal of the project was first identified as "improving the well-being of the people in the region" (Figure 1). Secondly, various problems which appear to be keeping society (represented in part by the Ghanaian government and technical assistance agencies) from achieving this stated goal were evaluated. A single, central problem emerged:

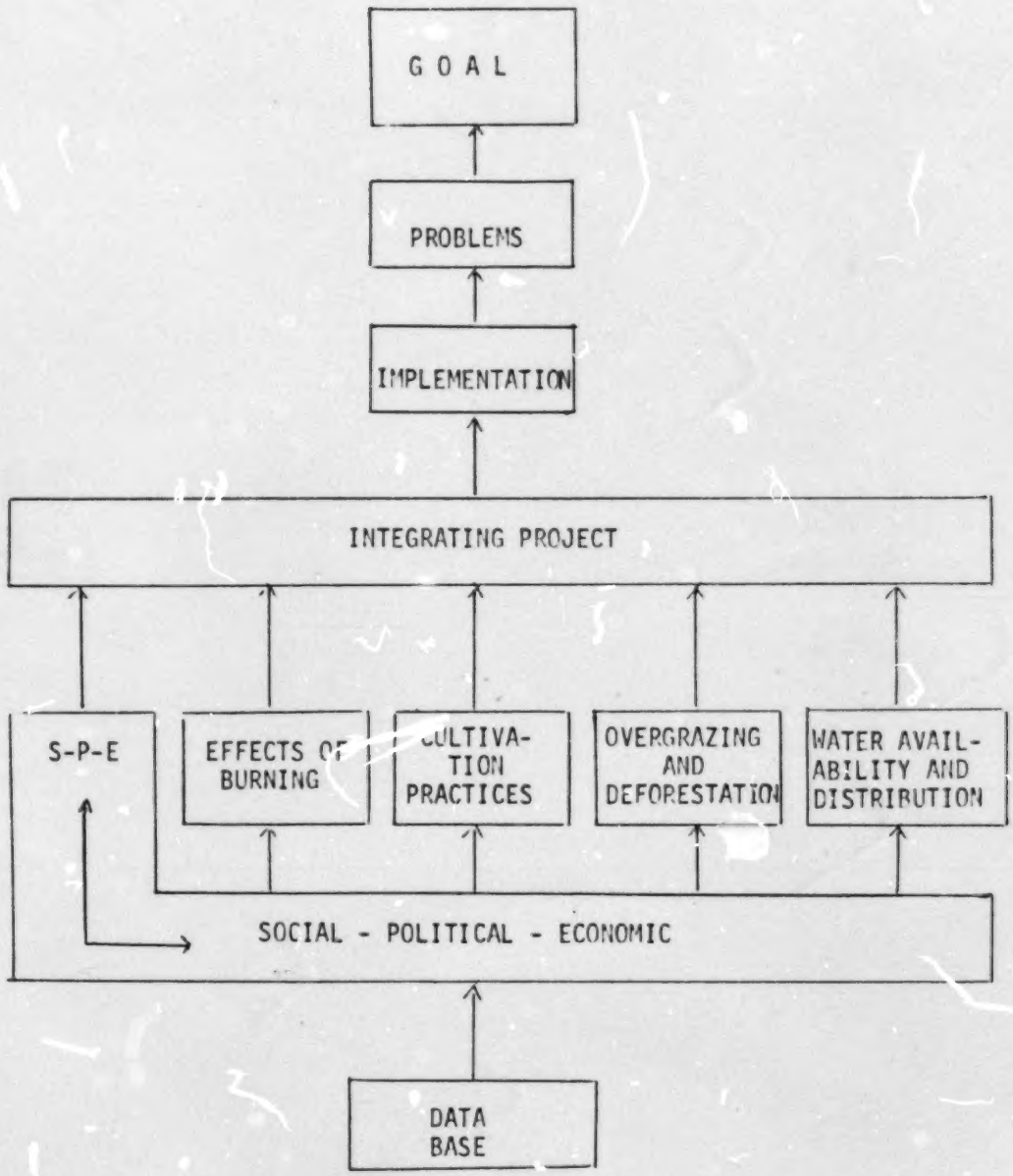

Figure 1. Overall Project Design

land degradation resulting in depressed agricultural production and human well-being.

Three objectives were uppermost as the detailed program to address this problem was constructed.

(1) The need to emphasize a multidisciplinary approach is paramount.

(2) The special role of the social-economic-political sector must be highlighted.

(3) Project activities must pass the implementation stage.

In application of the overall project design (Figure 1), one must observe both the horizontal and vertical interactions. For example, the study of soil erosion as a factor in land degradation is involved in all five of the research lines. Thus, sometimes a single discipline-oriented activity will serve the information needs of all theme areas.

The vertical orientation of the program also was discussed in detail by the team. Figure 2 depicts the relationships for the cultivation practices sub-project. The overall goal remains the same for the sub-projects as does the overall project problem. However, a new sub-problem is identified (bottom of diagram). From this starting point, one moves upward through the various steps shown.

A description of the action at each step is given on the right-hand side of the diagram, and some questions to be answered by the corresponding research required are listed on the left. Note the feedback loops which permit the user to go back through the process as new information is obtained.

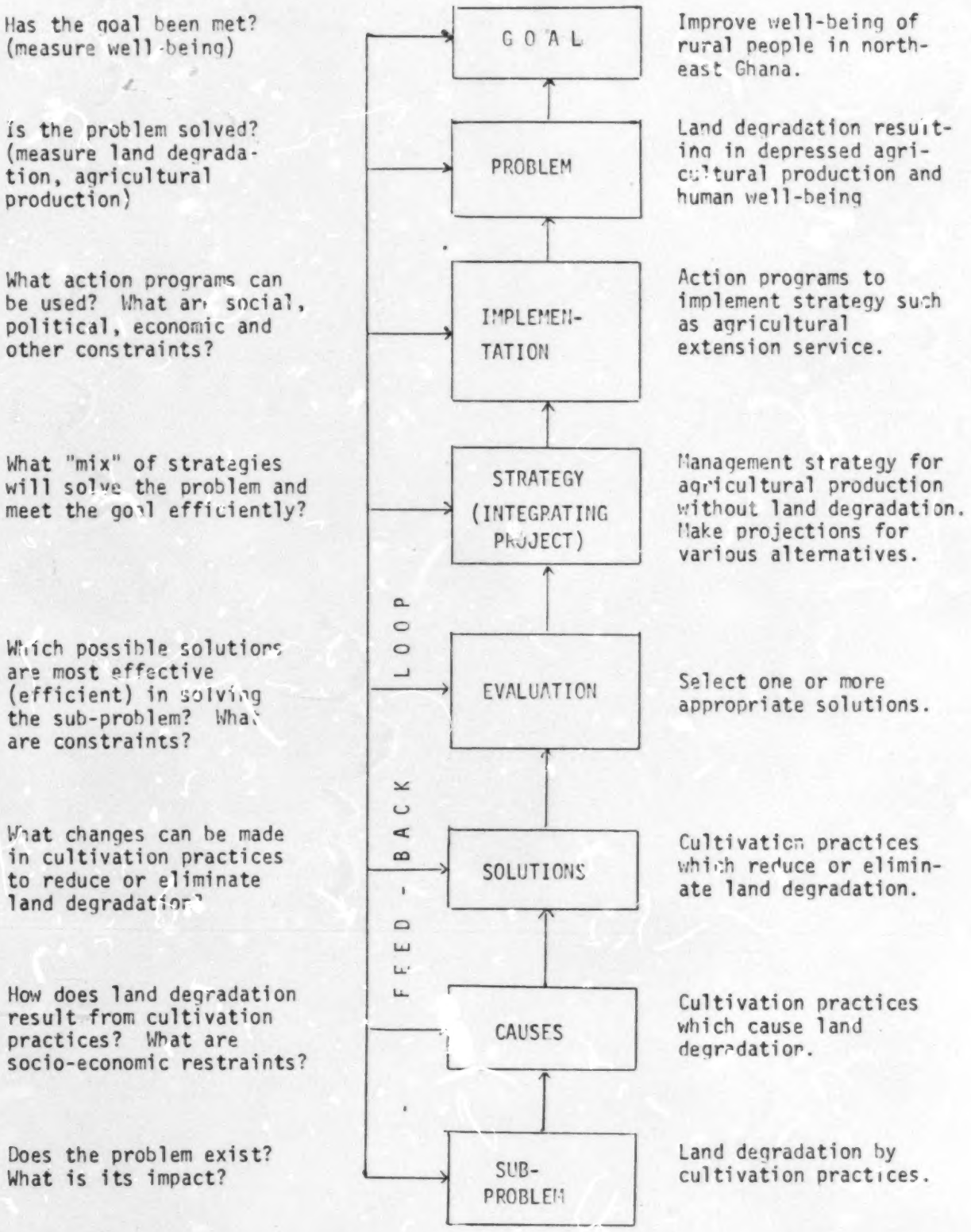
Has the goal been met? (measure well-being)
GOAL
Improve well-being of rural people in north-east Ghana.
Is the problem solved? (measure land degradation, agricultural production)
PROBLEM
Land degradation resulting in depressed agricultural production and human well-being
What action programs can be used? What are social, political, economic and other constraints?
IMPLEMENTATION
Action programs to implement strategy such as agricultural extension service.
What "mix" of strategies will solve the problem and meet the goal efficiently?
STRATEGY (INTEGRATING PROJECT)
Management strategy for agricultural production without land degradation. Make projections for various alternatives.
Which possible solutions are most effective (efficient) in solving the sub-problem? What are constraints?
EVALUATION
Select one or more appropriate solutions.
What changes can be made in cultivation practices to reduce or eliminate land degradation?
SOLUTIONS
Cultivation practices which reduce or eliminate land degradation.
How does land degradation result from cultivation practices? What are socio-economic restraints?
CAUSES
Cultivation practices which cause land degradation.
Does the problem exist? What is its impact?
SUB-PROBLEM
Land degradation by cultivation practices.
FEED - BACK LOOP

Figure 2. Logic for Cultivation Practices Problem Analysis and Project Design

Consideration of these general research questions led to the following more complete and comprehensive list of questions. The sub-project objectives and description were developed from this second list.

(1) Is land degradation occurring as a result of cultivation practices?

(2) What is the impact of such land degradation?

(3) What cultivation practices are resulting in land degradation?

(4) What socio-cultural aspects of the practices are significant?

(5) What changes can be made in the cultivation practices to reduce and eventually eliminate land degradation?

(6) Of the possible solutions, which one(s) are the most effective (efficient)?

(7) What socio-cultural restraints to acceptance of each solution are there?

(8) Can these proposed solutions be integrated with the solutions of other sub-problems in the synthesis of management strategies for natural resources?

(9) What projections of future effects of land degradation from cultivation practices (or elimination of degradation) can be made?

(10) How can the appropriate new or improved cultivation practices be implemented?

(11) What are the social-political-economic (and other) restraints to implementation? How can they be reduced or eliminated?

(12) To what extent is the land degradation problem solved?

(13) Has the well-being of rural people been improved?

This approach to problem solving, beginning with a clear statement and consensus on the overall project goal and the central problem and then proceeding to identify basic causes of the problem and research responses up through the stage of new management strategies and implementation methods was endorsed by the team as a very useful mechanism for conceptualizing the problem, eliminating irrelevancies, and promoting an integrated programmatic response.

Detailed Analysis and Synthesis of Sub-Projects

Following discussion of the Executive Committee's actions, the team for a second time reconstituted itself into working groups, each of which addressed one of the five major sub-project areas. Their task was to undertake detailed analyses in each of the areas, according to the following outline:

1. Objectives and Project Rationale (How does this sub-project relate to the overall project?)
2. Sub-project Description (Include statement regarding interdisciplinary nature of sub-project or its results and time schedule.)
3. Resources Required
   a. Manpower (Include total requirements by personnel category, and indicate where non-Ghanaian assistance is needed.)
   b. Budget

      Salaries and wages

      Travel and transportation

Equipment, supplies and miscellaneous

Training

The individual sub-projects were then evaluated by the executive committee with these criteria:

(1) Are it and/or its results interdisciplinary in nature?

(2) Does it contribute to the solution of regional problems?

(3) Does it address high priority national development goals?

(4) Are the manpower and budget requirements reasonably obtainable?

(5) Does it duplicate on-going or completed projects?

(6) What constraints to the success of this sub-project are foreseen and what provisions have been included to ameliorate them?

This information was subsequently synthesized by the executive committee into the final project which was then reviewed, modified and finally approved in plenary session as follows:

NORTHEAST GHANA SAVANNAH PROJECT

Excerpts of the project design as it finally emerged are given below.

Objectives

The specific project objectives were defined as:

1. To strengthen the capability of the Ghanaian scientific community to conduct interdisciplinary research which contributes directly and significantly to the solution of critical problems of socio-economic development ... particularly in the areas of agricultural production and the improved health and economic well-being of the peoples of the study region.

2. To identify more clearly and analyze the factors involved in possible desertification in the savannah zone of northern Ghana.
3. To investigate and implement cultivation and management practices which will halt and even reverse the trend toward increasing land degradation in the northeast region of Ghana, with a constant view to improving the living standards of the rural people.
4. To provide a coherent, integrated program which will stimulate and contribute to international programs addressing similar problems, and will attract funds from a wide variety of sources.

Description of Geographic Region

The geographical region for the project, as initially defined by the CSIR executive chairman was the "Northern Ghana Savannah Region," however, the team found that a sharper focus was needed to insure that the research effort is not spread too thinly and that the close collaborative multidisciplinary activities required to achieve the project objectives are not constrained.

The team then set about to define a region small enough to be manageable yet large enough to demonstrate a wide range of resource management problems, optimize use of available manpower and financial resources, and still enhance transferability of results to other regions in Ghana. It was finally agreed to designate the Tamne River Drainage Basin as the study region. It is located in the northeast area and contains approximately 200 square miles. The criteria used to make this

selection were: (1) evidence that land degradation has already occurred; (2) first region to sense any effect of continued drought in the Sahel to the north; (3) relatively high population density; (4) full spectrum of land use practices, infrastructure elements, physical and natural resources, and socio-cultural features in the northern Ghana savannah; (5) well-defined and complete hydrologic unit; (6) presence of agricultural research stations and two government planning areas; (7) adequate cross-section of the soils of the northeast; (8) elevational variation representative of the extremes of the region; (9) road network for essential transportation in conduct of the research and surveys; (10) Bawku, Garu and numerous villages of varying size; (11) availability of two frames of imagery obtained since 1972 by the Earth Resources Technology Satellite (ERTS) which provide coverage of the study region.

Statement of the Problem

The central problem of the northeast region of Ghana identified by the team is one of land degradation (incipient "desertification") resulting in depressed agricultural production and human well-being. The problem is caused by poor land use practices under the complex, dynamic interactions of natural ecosystems and socio-economic processes operating within a fragile environment where climate variability and periodic drought exacerbates problems of land and water management. The impacts of this problem include socio-economic and natural resources effects.

Project Description

The overall project consists of five sub-projects, but it was designed to promote their integration. Further, the individual sub-projects themselves consist of separate but interrelated tasks. Some individual tasks can be undertaken separately and in themselves produce meaningful results; however, it is expected that all of the tasks in each of the sub-projects will be accomplished, for it is only in this fashion that the benefits associated with integration of the research activities can be achieved.

Socio-economic sub-project

Socio-economic data are required to undergird and feed into all the other sub-projects. The purpose of this sub-project is the acquisition and analysis of such data.

Cultivation practices sub-project

Cultivation practices are a major factor in land degradation. The purpose of this sub-project is to investigate present practices and to explore, evaluate, and test alternative measures that can be implemented to provide long term sustained yield agricultural production.

Water availability and distribution sub-project

Problems of water availability and distribution contribute to land degradation. This sub-project is intended to improve water resources management in the study region. (Information essential to management decisions for the other sub-projects will be provided.)

Burning sub-project

The effects (both good and bad) of burning on crop production, range and soil resources, and the ecology of the savannah region are largely unknown. The purpose of this sub-project is to better understand these effects and develop appropriate strategies and policies for controlling burning. (This sub-project was selected as a separate line of research because burning was mentioned in so many of the proposed projects that an integrated effort to answer the questions raised seemed to be a reasonable approach.)

Overgrazing and deforestation sub-project

Overgrazing and deforestation are recognized as major contributors to land degradation. The purpose of this sub-project is to develop knowledge of vegetation patterns and trends, and to evaluate alternative technologies that will result in stabilization and increased productivity of livestock and forest resources.

Integrating project

This project is provided to integrate the results of the five research lines in the most effective way to solve the land degradation problem of northeast Ghana, and to assure that research efforts avoid data collection which may be peripheral and unnecessary with regard to the overall objectives. Integration will be brought about through systems analysis techniques and modelling of the natural resource base. Regular seminars and workshops will be organized for project leaders to maintain their focus on the central problem.

Resources Required

Each of the sub-project working groups was asked to develop manpower and budget estimates. The amount of detail and depth of analysis varied with each group, and to some extent this is reflected in the individual budget totals they obtained. Further, some estimates included substantial capital purchases and full-time staffing while others minimized capital purchases and attempted to budget on a released time basis for senior researchers.

In the final project documents the total budget approved by USAID/Ghana was $590,000. Exact allocations for the various sub-projects will be determined by CSIR.

Project Management

The overall responsibility for management and administration of the project is vested in the Executive Chairman, CSIR, acting through the Committee on Natural Resources. A Project Management Group (PMG) will be appointed by the Committee on Natural Resources with the following responsibilities:

(1) Preparation of detailed plans and policies.

(2) Solicitation, review, and approval of projects submitted by or through the research institutes and universities.

(3) Synthesis of projects into multidisciplinary integrated programs which also may be submitted to other funding sources.

(4) Approval of funded projects, and development and implementation of procedures for fund disbursement and accounting.

(5) Recommendation and monitoring of management policies, supervision of project coordination, and maintenance of liaison with project leaders.

(6) Review of project reports, publications and special seminars, and preparation of reports.

Essential day-to-day project management will be a Project Coordinator, administratively attached to the CSIR Secretariat.

Implementation Plan

The overall project design will serve as a guideline for CSIR to approach the Ghanaian scientific community to ask for proposals which emphasize cooperative multidisciplinary work. CSIR will then review the proposals, integrate them and provide the necessary budget for each.

The project management and socio-economic sub-project components will be initiated first. Early funding of the socio-economic sub-project will provide data, essential for use by the PMG in developing program packages and budgets in the other sub-project areas. The PMG should request scientists to propose projects and resource requirements on the remaining sub-projects as quickly as possible.

Tasks which cut across several sub-projects should receive early consideration, particularly where lead time is necessary. Such specific tasks may include: (1) natural resources inventory, (2) study of the existing climatological data, (3) identification of cooperating farmers, (4) establishment of Tamne River Drainage Basin gaging station, and (5) establishment of soil erosion study plots.

Relation of project to other programs

During recent years the impact of drought on growing human populations in many regions of the world, coupled with the increasing utilization of land which is marginally productive has triggered a variety of international, regional, and national programs and studies related to desertification, and the improved use of semi-arid lands. Activities related to the Northeast Ghana Savannah Project will be closely monitored, and mechanisms to promote the exchange of information will be developed. Further, possibilities for collaborative work will be investigated, including visits to project sites and the exchange of scientists. Several specific projects may have particular relevance and importance for example: (1) UNESCO'S Man and the Biosphere Program, (2) UN Environment Programme, (3) IBRD/UNDP/FAO/WHO Onchocerciasis Control Program, and (4) Earth Resources Technology Satellite Program (ERTS).

CONCLUSIONS AND RECOMMENDATIONS

The following is a brief recapitulation of the major conclusions resulting from the project design effort, and sets forth several specific recommendations made by the team.

(1) A research project focused on the land degradation problems of the Tamne River Drainage Basin of the northern Ghana savannah region was outlined and budgeted adequately for CSIR to seek donor funds.

(2) The project represents a good beginning for integrated, multidisciplinary research by Ghanaian scientists on Ghanaian problems.

(3) The teamwork required by the project design effort has had benefits over and above the preparation of a new project. A valuable experience has already been gained by participating Ghanaian scientists in working in a multidisciplinary, cooperative mode. Procedures and thought processes involved in problem identification and solution have been sharpened, and knowledge and appreciation of the specific problems of northeast Ghana have been increased.

(4) A strong commitment from the Ghanaian government and scientific community is essential to the success of the project. This must include the clear declaration of high priority for the solution to the land degradation, desertification, and other problems associated with human well-being in the northeast. Such a declaration must then be translated into action by the assignment to the project of top quality scientists to lead and contribute to research activities in a cooperative multidisciplinary effort.

(5) Donor agencies must provide funds for part-time student help, laborers and similar activities; equipment and supplies; and training and travel. As little as possible of the external assistance should be used to finance expatriate technical advisors and Ghanaian scientist salaries.

(6) Participation by citizens and institutions of the study region should be sought and actively encouraged to ensure that a base of interest and capability remains after the initial effort.

(7) Ghana participation in the arid lands component of other complementary international research programs is recommended.

(8) The approach to problem solving used in the project design is of a general nature and therefore is recommended to those involved in the design or evaluation of multidisciplinary, problem-oriented research and management programs in other regions. It is envisioned that a planning and analysis group being established by CSIR will apply the methodology to problem analysis and program design in other sectors which are also candidates for priority attention by the Ghanaian scientific community, e.g., agricultural mechanization, use of agricultural wastes, industrial standards, etc.

EPILOGUE

The success of the design effort for the Northeast Ghana Savannah Project was not necessarily unique but was, at least, unusual. In retrospect, then, it seems worthwhile to list some of the apparent reasons for its success.

(1) The advance preparation was excellent. The AID-NAS-CSIR workshops provided a good background. The arrangements made by AID/Washington, USAID/Ghana and CSIR for the concentrated effort were well planned and coordinated.

(2) The specific target for the project, i.e., poor land use practices in the savannah region, selected early in the procedure, kept the participants' attention from being dispersed to broad, general topics. A "shopping list" approach

was thereby avoided, and a bookshelf study was not produced.

(3) The use of an organized problem solving methodology helped the working groups to develop and improve their conceptualization of the sub-projects. The relationships among the sub-projects also were more easily visualized.

(4) The project design teams were small, well briefed, and selected for broad coverage of the appropriate disciplines. By the end of the design effort the work groups were well acquainted and interacting enthusiastically (sometimes vociferously!)

(5) Ghana was ready for this project. The base of well-trained scientists is sufficient, government support is available, and the problem of land degradation has received enough public attention to give it high priority.